Drug and poison information — the Tygerberg experience

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Abstract **This report is based on an analysis of 6 411 consultations processed by the Tygerberg Pharmacology and Toxicology Consultation Centre. Seventy-five per cent of the consultations were of a toxicological nature: 47% related to non-drug chemicals, 37% to drugs and 16% to plants and animals. Pesticides utilised in the home environment featured most prominently in the non-drug chemical group, while queries about paracetamol overdose topped the list in the drug group. The most frequent queries in the biological category concerned potentially poisonous plants. Twenty-five per cent of the consultations related to pharmacotherapeutics.**

Most potentially toxic exposures to non-drug chemicals occurred in the household setting. Contrary to popular belief, few acute pesticide poisonings were encountered as a result of exposures during farming activities. Another important finding was that there is a frustrating lack of reliable and readily available information in respect of potentially toxic ingredients contained in household and industrial preparations.

The large number of household exposures highlights the need for education in the safe storage and usage of non-drug chemicals. Legislation on the inclusion of basic toxicological information and warnings on labels of household and industrial non-drug chemical products should be considered. In addition, the Government should take responsibility for centralising information on all potentially toxic non-drug chemicals and make this information available to poison centres at all times. It is also imperative that more attention be given to the training of health care professionals in applied pharmacokinetics and toxicology.

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Since the establishment of the University of Stellenbosch's Faculty of Medicine, the Department of Pharmacology has been consulted regularly by medical practitioners, paramedical professionals and the public on pharmacological and toxicological matters. The increasing need for drug and poison information led, in 1977, to the establishment of the Pharmacology and Toxicology Consultation Centre. Since its founding, both the Consultation Centre and the analytical laboratory of the Department of Pharmacology have provided a 24-hour service. This paper focuses on the activities of the Centre. Problem areas are identified and recommendations made based on analysis of 6 411 drug and poison consultations.

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Methods

The Consultation Centre is housed in the Department of Pharmacology of the University of Stellenbosch's Faculty of Medicine; it forms an integral part of Tygerberg Hospital, a large 1 800-bed teaching hospital complex. The centre has direct access to an analytical laboratory 24 hours a day. It is staffed by a clinical pharmacist and five medical doctors who serve in a part-time capacity. Most of the enquiries and consultations are handled by telephone. The telephone number is listed with the emergency numbers in the Cape Peninsula telephone directory. The pharmacist handles most calls during office hours. Should clinical medical advice be needed, the doctor on duty is consulted. After hours and during weekends the doctor is responsible for all calls on the emergency number. All enquiries and consultations are recorded on specially designed data collection forms, which serve as a permanent record.

The facilities and data resources of the centre include a library containing a comprehensive collection of standard pharmacology and toxicology textbooks and journals. Specialised drug and toxicology information sources include Drugdex, Poisindex, Inpharma and Reactions; the centre also has direct access to Medline Toxline and Toxnet through the Institute of Biomedical Communication of the South African Medical Research Council. The medical library of the Faculty of Medicine is situated in the same building as the centre.

This report is based primarily on an analysis of consultations processed over 2 periods: a 2-year period from July 1986 to June 1988 (3 899 consultations) and a 1-year period from October 1990 to September 1991 (2 512 consultations). These two periods were chosen in order to identify trends.

Results

Table I analyses 6 411 consultations divided into general categories. Of these, 75% are of a toxicological nature while 25% relate to pharmacotherapeutic matters. Comparison of the two periods in which the analysis was done shows a small shift of 6% in favour of toxicological consultations. A further breakdown of the 1990/91 toxicological consultations shows the percentage of calls from outside Tygerberg Hospital (86%) as even higher than the figure reflected in the overall statistics. Conversely, the number of toxicological enquiries from within the teaching hospital is lower (54%) and that of pharmacotherapeutic consultations higher (46%) than figures from outside the hospital.

Patient-related enquiries have increased from 75% to 82% since the 1986 - 1988 analysis. Examples of non-patient-related consultations include questions about the merits of taking snakebite antivenom on hiking trips and advice on pesticides which can be used with relative safety in food preparation areas.

Most of the enquiries come from outside Tygerberg Hospital and the proportion of outside calls increased from 66% to 76% over the two periods. Although the majority of these come from the western Cape, a substantial number originate further afield. Seventy-five per cent are from professionals, such as medical doctors, pharmacists and nurses, and 25% from the lay public. However, it is noteworthy that there has been a decrease in the number of enquiries from the lay public (Table I).

The proportion of consultations pertaining to adults increased from 51% to 57%, with a commensurate decline in those relating to children. The proportion relating to the adolescent age group remained constant at 5 - 6%.

Toxicological consultations are classified as related to drugs, non-drug chemicals (household, agricultural and industrial agents) or biological matters (toxic plants and animals). The breakdown of these broad categories is depicted in Table II. Consultations in the non-drug chemical group exceed those in the drug group (47% v. 37%). In fact, the number of enquiries on household products alone is approximately equal to that of those in the drug category. There are relatively few agricultural (4,3%) and industrial (7%) toxicological consultations, while a substantial 16% of enquiries are about toxic plants and animals.

An analysis of patient-related toxicology consultations that took place in the 1990/91 period shows that 70% of all incidents are accidental and 30% intentional. Eighty-six per cent of the incidents took place in the home and its environs, while 8% occurred in the workplace and 6% in other localities.

Table III summarises the drugs involved in overdose incidents. Paracetamol (14%) and the benzodiazepines (10,9%) are most commonly involved. Other prominent categories include the antidepressants (6,4%), aspirin and other non-steroidal anti-inflammatory agents (7,8%), cardiovascular agents (5,9%), and antimicrobials (5,0%). Analgesics and agents that affect the central nervous system are responsible for more than half the drug overdoses.

In the non-drug chemical group (Table IV) pesticides feature most prominently (38,2%); nearly half of

TABLE I.
Breakdown of 6 411 consultations in terms of general categories

	1986 - 1988 (*N* = 3 899)		1990 - 1991 (*N* = 2 512)		
Categories	No.	%	No.	%	Average (%)
Toxicology	2 827	72,5	1 976	78,7	75,6
Pharmacotherapy	1 072	27,5	536	21,3	24,4
Patient-related	2 933	75,2	2 062	82,1	78,7
Non-patient-related	966	24,8	450	17,9	21,3
Tygerberg Hospital	1 315	33,7	601	23,9	28,8
Outside Tygerberg Hospital	2 584	66,3	1 911	76,1	71,2
Professionals	2 799	71,8	1 970	78,4	75,1
Lay public	1 100	28,2	542	21,6	24,9
Patient-related consults					
Adults	1 498	51,1	1 177	57,1	54,1
Children under 5 yrs	1 107	37,7	668	32,4	35,0
Children 5 - 13 yrs	178	6,1	98	4,7	5,4
Adolescents (13 - 19 yrs)	150	5,1	119	5,8	5,5

TABLE II.
Classification of toxicological consultations in major categories

	1986 - 1988		1990 - 1991		
Categories	No.	%	No.	%	Average (%)
Drugs	1 065	37,6	728	36,8	37,2
Household	979	34,6	719	36,4	35,5
Agriculture	130	4,6	79	4,0	4,3
Industrial	216	7,7	126	6,4	7,0
Biological	437	15,5	324	16,4	16,0
Total	2 827	100	1 976	100	100

TABLE III.
Drugs involved in drug overdose

	1986 - 1988		1990 - 1991		
Drug and drug categories	No.	%	No.	%	Average (%)
Paracetamol	161	14,6	104	13,4	14,0
Benzodiazepines	144	13,1	67	8,6	10,9
Antidepressants	74	6,7	47	6,1	6,4
Cardiovascular agents	61	5,5	49	6,3	5,9
Sedative hypnotics other than benzodiazepines	57	5,2	33	4,2	4,7
Aspirin	53	4,8	26	3,4	4,1
Other NSAIDs	51	4,6	22	2,8	3,7
Neuroleptics	49	4,5	35	4,5	4,5
Antimicrobials	47	4,3	44	5,7	5,0
Anti-epileptics	45	4,1	29	3,7	3,9
Respiratory system agents	38	3,5	30	3,9	3,7
Miscellaneous	321	29,1	290	37,4	33,2
Total	1 101*	100	776	100	100

* Some consultations involve more than one drug, therefore above totals do not correspond with totals in Table II.

these are cholinesterase inhibitors. Other chemicals commonly encountered include the volatile substances, inhalants and gases (18%), followed by soaps, detergents and bleaches (9,8%) and corrosives (9,6%).

The most frequent enquiries in the biological category are those about potentially poisonous plants (29,1%), followed by those to do with spider bites (26,5%), snake bites (15,5%) and scorpion stings (13,3%) (Table V). Insect bites and stings are low on the list, with bee stings being the most common. Included in the miscellaneous group are the occasional bites from suspected rabid animals.

Table VI provides a summary of the pharmacotherapy consultations. Forty-six per cent are from Tygerberg Hospital and 54% from elsewhere. Antimicrobial agents feature most prominently, followed by cardiovascular and anti-epileptic drugs. For the period October 1990 to September 1991 pharmacokinetic and therapeutic drug monitoring enquiries comprise 26%, adverse drug reactions 21%, drugs of choice 18%, drug interactions 8%, drugs in pregnancy and lactation 7%, drugs in porphyria 4%, and miscellaneous queries 16%. Most of the questions on pharmacokinetics and therapeutic drug monitoring relate to correct timing of blood specimens and the interpretation of drug levels.

Discussion and problem identification

In the USA, where poison information services are well known and integrated into the emergency services, up to 80% of calls come from the lay public.[1] For poison information centres such as these it is possible to make a fair estimation of the general occurrence of exposures and poisonings.[2] At the Tygerberg Centre, on the other hand, approximately 80% of requests for information come from health care professionals, so that most of the enquiries have already undergone a screening process. Therefore, statistics derived from analysis of enquiries and consultations received by a centre such as ours should be interpreted with caution. The spectrum of consultations received by our centre may well be a reflection of the needs of professionals rather than a barometer of the incidence of exposures to potentially toxic substances in the community. Furthermore, a distinction should be drawn between exposures to potentially toxic substances and true poisonings, since the one does not necessarily lead to the other. With limited patient contact, the final outcome of exposures is not always known and we have not attempted to differentiate between the two in our statistics.

It is clear from the data that the main function of the

TABLE IV.
Toxicological consultations regarding household, agricultural and industrial agents (non-drug chemicals)

	1986 - 1988		1990 - 1991		
Broad categories	No.	%	No.	%	Average (%)
Pesticides (excluding cholinesterase inhibitors)	265	20,0	197	21,4	20,7
Cholinesterase inhibitors	252	19,0	147	15,9	17,5
Volatiles, inhalants and gases	213	16,1	184	19,9	18,0
Corrosives	152	11,5	72	7,8	9,6
Soaps, detergents and bleaches	94	7,1	116	12,5	9,8
Miscellaneous	349	26,3	208	22,5	24,4
Total	1 325	100	924	100	100

TABLE V.
Biological toxicology consultations

	1986 - 1988		1990 - 1991		
Categories	No.	%	No.	%	Average (%)
Plants	129	29,5	93	28,7	29,1
Spiders	108	24,7	92	28,4	26,5
Snakes	66	15,1	51	15,8	15,5
Scorpions	60	13,7	42	13,0	13,3
Mushrooms	33	7,6	14	4,3	5,9
Marine	25	5,7	22	6,8	6,3
Insects	12	2,8	7	2,1	2,5
Miscellaneous	4	0,9	3	0,9	0,9
Total	437	100	324	100	100

TABLE VI.
Pharmacotherapy consultations

	1986 - 1988		1990 - 1991		
Drug categories	No.	%	No.	%	Average (%)
Antimicrobial	312	29,1	133	24,8	27,0
Cardiovascular	109	10,2	65	12,1	11,1
Anti-epileptic	84	7,8	52	9,7	8,8
Neuroleptic and anti-histamine	63	5,9	13	2,4	4,2
Antidepressant	52	4,9	22	4,1	4,5
Benzodiazepines, barbiturates and other sedative hypnotics	44	4,1	31	5,9	5,0
Respiratory	42	3,9	15	2,8	3,3
Miscellaneous	366	34,1	205	38,2	36,1
Total	1 072	100	536	100	100

centre is to provide a toxicology service, and that the need for information is greater in the non-drug chemical category than with regard to drug toxicity and drug overdose. This may well reflect a lack of readily available information and knowledge on toxic non-drug chemicals rather than a higher incidence of exposures to these agents.

Indeed, there is a frustrating lack of information in respect of potentially toxic ingredients contained in household preparations in commercial use. Labels on such products seldom provide adequate information on ingredients, and often contain no warnings about their potential toxicity. An all too familiar statement on the label is 'Contact a doctor in case of a toxic exposure'. This offers no safeguard as medical doctors also need to know what the products contain if they are to be of service. Although secrecy regarding precise product composition may be justified, basic toxicological information such as 'treat as a corrosive acid' or 'volatile hydrocarbon' should be supplied on the label. Manufacturers, while willing to give information, are difficult to trace and are usually not available after business hours.

The poisonous non-drug chemicals on which we are consulted most are pesticides, especially the cholinesterase inhibitors. The majority of these consultations relate to household and garden preparations bought at local supermarkets or hardware stores. As a result of inadequate warnings on labels, public ignorance of the toxicity of these agents is alarming. Open displays of pesticides in grocery stores, often close to foodstuffs and within reach of children, may contribute to this problem.

Contrary to popular belief, acute organophosphate poisoning as a result of exposure of farm labourers during the spraying season is relatively uncommon. In fact, surprisingly few serious acute pesticide poisonings occur as a result of exposure during farming activities.[3] Those reported from the farming areas usually fall within the household category, e.g. in cases where the pesticide has been brought into the house in an unmarked container.

Although paraffin (kerosene) poisoning is common among members of the lower socio-economic sectors of the population,[4] the number of consultations in this regard is low. The reason for this is that most health care professionals are familiar with its dangers and management. Volatile substances on which we are more frequently consulted are turpentine, thinners and petrol (gasoline).

The large number of exposures to corrosives, especially in the home setting, gives cause for concern. Recently, there has been an increase in the number of exposures of children to the dangerous corrosive, potassium permanganate. Soaps, detergents and bleaches, especially 'Jik' and other hypochlorite solutions, feature prominently, but fortunately these agents have a relatively low degree of toxicity.

Paracetamol is the drug most frequently involved in accidental as well as intentional overdose. The lay public is largely unaware of the potential toxicity of paracetamol when taken in overdose. The customary open display of paracetamol, aspirin and analgesic combinations in shops may contribute to the general misconception that these drugs are safe.[5,6] The surprisingly high rate of consultations about cardiovascular drug overdose in children is also a cause for concern. These rank second to paracetamol with regard to queries about paediatric drug overdose. Grandparents, unaware of the potential danger, often leave cardiovascular medications within easy reach of curious young children. The relatively high incidence of antibiotic overdose in youngsters is also indicative of adult negligence with regard to the safe storage of medicines.

The large number of enquiries on spider bites and scorpion stings, while reflecting a relatively high rate of occurrence, may also suggest a lack of knowledge and expertise. Ingestion of small quantities of potentially poisonous plants is common in children under the age of 5. Fortunately, owing to the small amount ingested, acute plant poisonings are rare.

A quarter of all drug therapy consultations were about pharmacokinetics and therapeutic drug monitoring. The type of pharmacokinetic problems encountered suggests a relative lack of knowledge in respect of interpretation of drug levels. The rapidly expanding choice of antimicrobial agents available on the market probably accounts for the large number of enquiries about them (Table VI).

Ignorance with regard to the interpretation of toxicological screenings is also noteworthy. There exists a tendency to send blood and urine to the laboratory for a 'screen' in the belief that it is a fail-safe method for excluding or positively identifying a poison. Because of time constraints, expense and the enormous number of potentially toxic substances commonly encountered, standard toxicological screenings cover only the most frequently encountered possibilities. As a result, the high percentage of 'negative' toxicological screenings reported may be 'false negatives'. A negative outcome simply means that the screening is negative for those items tested and not for all possibilities. Therefore, requests for toxicological screenings, without an understanding of their limitations, can be hazardous.[7,8]

In the light of the above important observations, we make the following recommendations:

1. Stricter control should be exercised over the distribution, sale and use of organophosphate and other potentially hazardous pesticides, especially those intended for the household market. As most acute exposures to potentially poisonous substances occur in the home environment, educational efforts to reduce the risk of acute poisoning should be directed chiefly towards the household.

2. The Government should take responsibility for centralising information on all potentially toxic non-drug chemicals and make this information available to poison centres at all times. In addition, legislation to include basic toxicological information and warnings on labels of industrial and household non-drug chemical products should be enacted, similar to regulations regarding agricultural pesticides.

3. Stricter control should be exercised on the availability and use of potentially hazardous drugs, such as paracetamol and other 'over-the-counter' analgesics and analgesic combinations.

4. More attention should be devoted to the training of health care professionals in clinical pharmacokinetics and toxicology.

Medical and paramedical professionals are encouraged to use the Tygerberg Pharmacology and Toxicology Consultation Centre. The telephone numbers are: (021) 938-6235/6084 (office hours) and (021) 931-6129 (24 hours); the fax number is (021) 931-7810.

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